

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)



Applicant's or agent's file reference INT1004/MAJR	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/ZA00/00155	International filing date (day/month/year) 31/08/2000	Priority date (day/month/year) 01/09/1999
International Patent Classification (IPC) or national classification and IPC C22B3/18		
Applicant BILLITON SA LIMITED et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 4 sheets, including this cover sheet.  
  
☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 6 sheets.

3. This report contains indications relating to the following items:

- |      |   |
|------|---|
| I    | <input checked="" type="checkbox"/> Basis of the report   |
| II   | <input type="checkbox"/> Priority   |
| III  | <input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability   |
| IV   | <input type="checkbox"/> Lack of unity of invention   |
| V    | <input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement |
| VI   | <input type="checkbox"/> Certain documents cited  |
| VII  | <input type="checkbox"/> Certain defects in the international application   |
| VIII | <input type="checkbox"/> Certain observations on the international application  |

Date of submission of the demand  26/03/2001	Date of completion of this report  22.11.2001
Name and mailing address of the international preliminary examining authority:   European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016	Authorized officer  Bombeke, M  Telephone No. +31 70 340 3576  

From the  
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To:

McCALLUM RADEMEYER & FREIMOND  
P.O. Box 1130  
2125 Randburg  
AFRIQUE DU SUD

PCT

NOTIFICATION OF TRANSMITTAL OF  
THE INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT

(PCT Rule 71.1)

Date of mailing  
(day/month/year) 22.11.2001

Applicant's or agent's file reference  
INT1004/MAJR

IMPORTANT NOTIFICATION

International application No.  
PCT/ZA00/00155

International filing date (day/month/year)  
31/08/2000

Priority date (day/month/year)  
01/09/1999

Applicant  
BILLITON SA LIMITED et al.

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. REMINDER

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

Name and mailing address of the IPEA/



European Patent Office - P.B. 5818 Patentlaan 2  
NL-2220 HV Rijswijk - Pays Bas  
Tel. +31 70 340 - 2040 Tx: 31 651 epo nl  
Fax: +31 70 340 - 3016

Authorized officer

Dekker, M



Tel.+31 70 340-4046



## PCT

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference INT1004/MAJR		<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/ZA00/00155	International filing date (day/month/year) 31/08/2000	Priority date (day/month/year) 01/09/1999	
International Patent Classification (IPC) or national classification and IPC C22B3/18			
Applicant BILLITON SA LIMITED et al.			
<p>1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 4 sheets, including this cover sheet.</p> <p><input checked="" type="checkbox"/> This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).</p> <p>These annexes consist of a total of 6 sheets.</p>			
<p>3. This report contains indications relating to the following items:</p> <p>I <input checked="" type="checkbox"/> Basis of the report</p> <p>II <input type="checkbox"/> Priority</p> <p>III <input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p>IV <input type="checkbox"/> Lack of unity of invention</p> <p>V <input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p>VI <input type="checkbox"/> Certain documents cited</p> <p>VII <input type="checkbox"/> Certain defects in the international application</p> <p>VIII <input type="checkbox"/> Certain observations on the international application</p>			
Date of submission of the demand 26/03/2001		Date of completion of this report 22.11.2001	
Name and mailing address of the international preliminary examining authority:  European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016		Authorized officer Bombeke, M Telephone No. +31 70 340 3576 	

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/ZA00/00155

**I. Basis of the report**

1. With regard to the elements of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

1,4-6 as originally filed

2,3,3A as received on 31/08/2001 with letter of 30/08/2001

**Claims, No.:**

1-11 as received on 31/08/2001 with letter of 30/08/2001

**Drawings, sheets:**

1/1 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/ZA00/00155

- ☐ the description,      pages:  
☐ the claims,      Nos.:  
☐ the drawings,      sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):  
*(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

6. Additional observations, if necessary:

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

**1. Statement**

Novelty (N)	Yes: Claims 1-11
	No: Claims
Inventive step (IS)	Yes: Claims 1-11
	No: Claims
Industrial applicability (IA)	Yes: Claims 1-11
	No: Claims

- 2. Citations and explanations**  
**see separate sheet**

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT - SEPARATE SHEET**

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International application No. PCT/ZA00/00155

**Re Item V**

**Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

Document EP-A-522978 and the Livesey-Goldblatt publication (1986) on "Bacterial leaching of gold, uranium, pyrite bearing compacted mine tailing slimes", both cited on amended page 2 of the description, are considered to represent the most relevant state of the art to the subject-matter of claims 1-11.

The recovery of base metals from a tailings dump as defined in claims 1-11 differs from said closest art by the combination of specific core features to the "loosening" of the dump surface layer and to the "adjustment of the pH and the moisture content" of said surface layer.

The indicated process distinctions are not fairly suggested in any one of the prior art citations either, nor obviously derivable from any document combination.

It follows that the subject-matter of claims 1-11 fulfills the criterion to novelty respectively inventive step as set forth in Article 33(2) resp. Article 33(3) PCT.

The claimed base metal recovery process is industrially applicable in the field of hydro-metallurgical metal extraction (Article 33(4) PCT).

In the processes described in these publications oxidized minerals in the form of soluble iron and sulphate are dissolved. These processes are however principally directed to the recovery of gold.

A publication entitled "Bacterial Leaching of Gold, Uranium, Pyrite Bearing Compacted Mine Tailing Slimes" (Database Compendex 'Online! Engineering Information, Inc., New York, NY, US; Livesey-Goldblatt Eric: "Bacterial Leaching of Gold, Uranium, Pyrite Bearing Compacted Mine Tailing Slimes" Database accession no. EIX88010014488, XP002156692 abstract) describes a process of loosening the compacted material to allow air and water penetration, and inoculation of the material with bacteria. EP-A-522978 describes precious metal recovery from a heap to which is added a bio-oxidation solution and a leaching solution. These documents do not however specifically address the problem of recovering base metals from tailings dams or dumps.

#### SUMMARY OF THE INVENTION

The invention provides a method of recovering base metal from a tailings dump which includes the steps of:

- (a) aerating a surface layer of the dump by agitating or mechanically loosening the surface layer;
- (b) providing conditions favourable for bacterial oxidation of sulphide minerals by:
  - (1) adjusting the pH of the surface layer to a level in the range of from 1,3 to 2,0, and
  - (2) adjusting the moisture content of the surface layer to a value of from 16% to 20%;

- (c) allowing bacterial oxidation to take place for a controlled period;
- (d) after the controlled period removing the oxidised surface layer and adding water thereto to form a slurry;
- (e) separating the slurry into solids and a solution; and
- 5 (f) recovering base metal from the solution.

The aforementioned method lends itself particularly to the recovery of copper from a tailings dump.

The aeration of the surface layer may be achieved in any appropriate manner for example by ploughing the surface layer to a required depth which may be of the order of  
10 from 0,5 to 1,0 metres.

The pH of the surface layer may be adjusted by adding acid eg. sulphuric acid thereto. The pH may be brought to a level in the range of from 1,3 to 2,0.

The duration of the controlled period during which bacterial oxidation takes place should be sufficient to ensure that substantially all of the sulphide minerals are oxidized. The  
15 duration of this period is dependent on physical conditions and on the nature of minerals. Thus, for example, the duration of the period may be temperature dependent and may also be affected by the depth of the surface layer, the degree of aeration which is achieved and the recovery figure which is being aimed at. Thus the duration of the controlled period may be at least four weeks.

20 The oxidized surface layer may be removed using any appropriate techniques. Thus the oxidized surface layer may be removed mechanically and water may then be added to the surface layer. One may also make use of water jets which are emitted by water



guns or the like and which washes the surface layer from the tailings dump. Additional water, or a suitable aqueous solution, may be added to the material which is washed away to form a slurry of a desired consistency.

The slurry may be agitated. This step may be carried out in a tank.

- 5 The base metal in sulphate form in solution may be separated from the slurry. The remaining solids may be washed to ensure effective recovery of the base metal sulphates.

## CLAIMS

1. A method of recovering base metal from a tailings dump which includes the steps of:
  - (a) aerating a surface layer of the dump by agitating or mechanically loosening the surface layer;
  - (b) providing conditions favourable for bacterial oxidation of sulphide minerals by:
    - (1) adjusting the pH of the surface layer to a level in the range of from 1,3 to 2,0, and
    - (2) adjusting the moisture content of the surface layer to a value of from 16% to 20%;
  - (c) allowing bacterial oxidation to take place for a controlled period;
  - (d) after the controlled period removing the oxidised surface layer and adding water thereto to form a slurry;
  - (e) separating the slurry into solids and a solution; and
  - (f) recovering base metal from the solution.
2. A method according to claim 1 wherein the surface layer is aerated by ploughing the surface layer to a depth of between 0,5 to 1,0 metres.
3. A method according to claim 1 or 2 wherein the pH is adjusted by adding sulphuric acid to the surface layer.
4. A method according to any one of claims 1 to 3 wherein the said controlled period, in step (c), is at least four weeks.

5. A method according to any one of claims 1 to 4 wherein the oxidised surface layer is removed by at least one of the following: by mechanical means, and by the use of water jets.
6. A method according to any one of claims 1 to 5 wherein the slurry is directed to at least one tank in which agitation of the slurry takes place.
7. A method according to any one of claims 1 to 6 wherein base metal in sulphate form in solution is separated from the slurry.
8. A method according to any one of claims 1 to 7 wherein step (f) is carried out using solvent extraction or ion exchange techniques.
9. A method according to any one of claims 1 to 8 used for the recovery of copper from a tailings dump.
10. A method according to claim 9 wherein the tailings result from the grinding of copper ores followed by a flotation process.
11. A copper recovery process wherein copper ore is ground and then subjected to a flotation process which results in tailings which are transferred to a tailings pile, and wherein the tailings pile is subjected to the following: a surface layer of the pile is loosened and aerated, the pH of the surface layer is adjusted to a value in the range of from 1,3 to 2,0, the moisture content of the pile is adjusted to lie in a range of from 16% to 20%, and at least sulphide minerals in the surface layer are bacterially oxidised for a controlled period, whereafter the surface layer is

removed, mixed with water to form a slurry which is conveyed to at least one agitation tank and, in the tank, the slurry is separated into solids and a solution from which copper is extracted using solvent extraction or ion exchange techniques.

From the INTERNATIONAL SEARCHING AUTHORITY

**PCT**

NOTIFICATION OF TRANSMITTAL OF  
THE INTERNATIONAL SEARCH REPORT  
OR THE DECLARATION

(PCT Rule 44.1)

To:

McCALLUM RADEMEYER & FREIMOND  
P.O. Box 1130  
7 Maclyn House, Bordeaux  
2125 Randburg  
SOUTH AFRICA

Date of mailing  
(day/month/year)

19/01/2001

Applicant's or agent's file reference

INT1004/MAJR

**FOR FURTHER ACTION**

See paragraphs 1 and 4 below

International application No.

PCT/ZA 00/00155

International filing date  
(day/month/year)

31/08/2000

Applicant

BILLITON SA LIMITED et al.

1. ☒ The applicant is hereby notified that the International Search Report has been established and is transmitted herewith.

**Filing of amendments and statement under Article 19:**

The applicant is entitled, if he so wishes, to amend the claims of the International Application (see Rule 46):

**When?** The time limit for filing such amendments is normally 2 months from the date of transmittal of the International Search Report; however, for more details, see the notes on the accompanying sheet.

**Where?** Directly to the International Bureau of WIPO  
34, chemin des Colombettes  
1211 Geneva 20, Switzerland  
Facsimile No.: (41-22) 740.14.35

For more detailed instructions, see the notes on the accompanying sheet.

2. ☐ The applicant is hereby notified that no International Search Report will be established and that the declaration under Article 17(2)(a) to that effect is transmitted herewith.

3. ☐ With regard to the protest against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

☐ the protest together with the decision thereon has been transmitted to the International Bureau together with the applicant's request to forward the texts of both the protest and the decision thereon to the designated Offices.

☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. **Further action(s):** The applicant is reminded of the following:

Shortly after **18 months** from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau as provided in Rules 90bis.1 and 90bis.3, respectively, before the completion of the technical preparations for international publication.

Within **19 months** from the priority date, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase until 30 months from the priority date (in some Offices even later).

Within **20 months** from the priority date, the applicant must perform the prescribed acts for entry into the national phase before all designated Offices which have not been elected in the demand or in a later election within 19 months from the priority date or could not be elected because they are not bound by Chapter II.

Name and mailing address of the International Searching Authority



European Patent Office, P.B. 5818 Patentlaan 2  
NL-2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax: (+31-70) 340-3016

Authorized officer

Maria Van der Hoeven

## NOTES TO FORM PCT/ISA/220

These Notes are intended to give the basic instructions concerning the filing of amendments under article 19. The Notes are based on the requirements of the Patent Cooperation Treaty, the Regulations and the Administrative Instructions under that Treaty. In case of discrepancy between these Notes and those requirements, the latter are applicable. For more detailed information, see also the PCT Applicant's Guide, a publication of WIPO.

In these Notes, "Article", "Rule", and "Section" refer to the provisions of the PCT, the PCT Regulations and the PCT Administrative Instructions respectively.

### INSTRUCTIONS CONCERNING AMENDMENTS UNDER ARTICLE 19

The applicant has, after having received the international search report, one opportunity to amend the claims of the international application. It should however be emphasized that, since all parts of the international application (claims, description and drawings) may be amended during the international preliminary examination procedure, there is usually no need to file amendments of the claims under Article 19 except where, e.g. the applicant wants the latter to be published for the purposes of provisional protection or has another reason for amending the claims before international publication. Furthermore, it should be emphasized that provisional protection is available in some States only.

#### What parts of the international application may be amended?

Under Article 19, only the claims may be amended.

During the international phase, the claims may also be amended (or further amended) under Article 34 before the International Preliminary Examining Authority. The description and drawings may only be amended under Article 34 before the International Examining Authority.

Upon entry into the national phase, all parts of the international application may be amended under Article 28 or, where applicable, Article 41.

#### When?

Within 2 months from the date of transmittal of the international search report or 16 months from the priority date, whichever time limit expires later. It should be noted, however, that the amendments will be considered as having been received on time if they are received by the International Bureau after the expiration of the applicable time limit but before the completion of the technical preparations for international publication (Rule 46.1).

#### Where not to file the amendments?

The amendments may only be filed with the International Bureau and not with the receiving Office or the International Searching Authority (Rule 46.2).

Where a demand for international preliminary examination has been/is filed, see below.

#### How?

Either by cancelling one or more entire claims, by adding one or more new claims or by amending the text of one or more of the claims as filed.

A replacement sheet must be submitted for each sheet of the claims which, on account of an amendment or amendments, differs from the sheet originally filed.

All the claims appearing on a replacement sheet must be numbered in Arabic numerals. Where a claim is cancelled, no renumbering of the other claims is required. In all cases where claims are renumbered, they must be renumbered consecutively (Administrative Instructions, Section 205(b)).

The amendments must be made in the language in which the international application is to be published.

#### What documents must/may accompany the amendments?

##### Letter (Section 205(b)):

The amendments must be submitted with a letter.

The letter will not be published with the international application and the amended claims. It should not be confused with the "Statement under Article 19(1)" (see below, under "Statement under Article 19(1)").

The letter must be in English or French, at the choice of the applicant. However, if the language of the international application is English, the letter must be in English; if the language of the international application is French, the letter must be in French.

## NOTES TO FORM PCT/ISA/220 (continued)

The letter must indicate the differences between the claims as filed and the claims as amended. It must, in particular, indicate, in connection with each claim appearing in the international application (it being understood that identical indications concerning several claims may be grouped), whether

- (i) the claim is unchanged;
- (ii) the claim is cancelled;
- (iii) the claim is new;
- (iv) the claim replaces one or more claims as filed;
- (v) the claim is the result of the division of a claim as filed.

The following examples illustrate the manner in which amendments must be explained in the accompanying letter:

1. [Where originally there were 48 claims and after amendment of some claims there are 51]:  
"Claims 1 to 29, 31, 32, 34, 35, 37 to 48 replaced by amended claims bearing the same numbers; claims 30, 33 and 36 unchanged; new claims 49 to 51 added."
2. [Where originally there were 15 claims and after amendment of all claims there are 11]:  
"Claims 1 to 15 replaced by amended claims 1 to 11."
3. [Where originally there were 14 claims and the amendments consist in cancelling some claims and in adding new claims]:  
"Claims 1 to 6 and 14 unchanged; claims 7 to 13 cancelled; new claims 15, 16 and 17 added." or  
"Claims 7 to 13 cancelled; new claims 15, 16 and 17 added; all other claims unchanged."
4. [Where various kinds of amendments are made]:  
"Claims 1-10 unchanged; claims 11 to 13, 18 and 19 cancelled; claims 14, 15 and 16 replaced by amended claim 14; claim 17 subdivided into amended claims 15, 16 and 17; new claims 20 and 21 added."

### "Statement under article 19(1)" (Rule 46.4)

The amendments may be accompanied by a statement explaining the amendments and indicating any impact that such amendments might have on the description and the drawings (which cannot be amended under Article 19(1)).

The statement will be published with the international application and the amended claims.

It must be in the language in which the international application is to be published.

It must be brief, not exceeding 500 words if in English or if translated into English.

It should not be confused with and does not replace the letter indicating the differences between the claims as filed and as amended. It must be filed on a separate sheet and must be identified as such by a heading, preferably by using the words "Statement under Article 19(1)."

It may not contain any disparaging comments on the international search report or the relevance of citations contained in that report. Reference to citations, relevant to a given claim, contained in the international search report may be made only in connection with an amendment of that claim.

### Consequence if a demand for international preliminary examination has already been filed

If, at the time of filing any amendments under Article 19, a demand for international preliminary examination has already been submitted, the applicant must preferably, at the same time of filing the amendments with the International Bureau, also file a copy of such amendments with the International Preliminary Examining Authority (see Rule 62.2(a), first sentence).

### Consequence with regard to translation of the international application for entry into the national phase

The applicant's attention is drawn to the fact that, where upon entry into the national phase, a translation of the claims as amended under Article 19 may have to be furnished to the designated/elected Offices, instead of, or in addition to, the translation of the claims as filed.

For further details on the requirements of each designated/elected Office, see Volume II of the PCT Applicant's Guide.

## PCT

## INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference <b>INT1004/MAJR</b>	<b>FOR FURTHER ACTION</b> see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. <b>PCT/ZA 00/ 00155</b>	International filing date (day/month/year) <b>31/08/2000</b>	(Earliest) Priority Date (day/month/year) <b>01/09/1999</b>
Applicant <b>BILLITON SA LIMITED et al.</b>		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 3 sheets.



It is also accompanied by a copy of each prior art document cited in this report.

## 1. Basis of the report

- a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.



the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

- b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing:



contained in the international application in written form.



filed together with the international application in computer readable form.



furnished subsequently to this Authority in written form.



furnished subsequently to this Authority in computer readable form.



the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.



the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ **Certain claims were found unsearchable** (See Box I).

3. ☐ **Unity of invention is lacking** (see Box II).

4. With regard to the **title**,

the text is approved as submitted by the applicant.



the text has been established by this Authority to read as follows:

**BASE METAL RECOVERY FROM A TAILINGS DUMP BY BACTERIAL OXIDATION**

5. With regard to the **abstract**,

the text is approved as submitted by the applicant.



the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.

as suggested by the applicant.



because the applicant failed to suggest a figure.



because this figure better characterizes the invention.

1



None of the figures.



## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 C22B3/18 C22B15/00

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 C22B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

COMPENDEX, WPI Data, PAJ, EPO-Internal

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DATABASE COMPENDEX 'Online! ENGINEERING INFORMATION, INC., NEW YORK, NY, US; LIVESEY-GOLDBLATT ERIC: "BACTERIAL LEACHING OF GOLD, URANIUM, PYRITE BEARING COMPACTED MINE TAILING SLIMES" Database accession no. EIX88010014488 XP002156692	1,2
Y	abstract  & FUNDAMENTAL AND APPLIED BIOHYDROMETALLURGY, PROCEEDINGS OF THE SIXTH INTERNATIONAL SYMPOSIUM ON BIOHYDROMETALLURGY.;VANCOUVER, BC, CAN, 1986, pages 89-96, Amsterdam, Neth  ----- -/--	4,5,8, 10-14

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

## \* Special categories of cited documents:

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*E\* earlier document but published on or after the international filing date
- \*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \*O\* document referring to an oral disclosure, use, exhibition or other means
- \*P\* document published prior to the international filing date but later than the priority date claimed

\*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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Date of the actual completion of the international search

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X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons A : member of the same patent family, corresponding document	